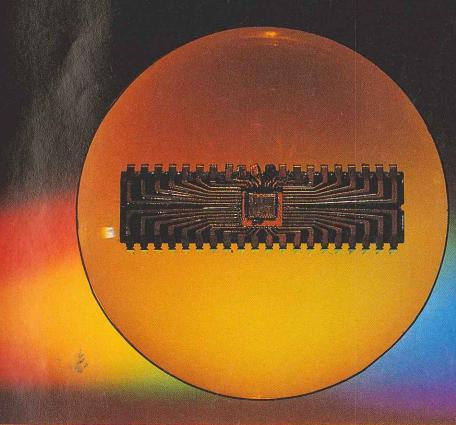
Popular Electronics MAGAZINE SEPTEMBER 1981/\$1

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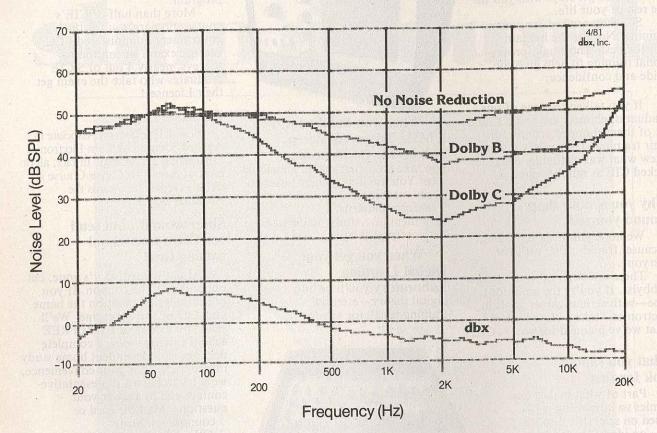
New Ways to Use 8080 Microprocessors



פספ שש שי שי פספים פספים:

gram 8000 Turntable le II Plus Personal Computer

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Noise from biased Chromium Dioxide cassette tape, comparing Dolby and dbx noise reduction systems. One third octave analysis. Tape noise level referenced to 200 nWb/m = 110 dB SPL.

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Popular Electronics Tests



The Apple II Plus Personal Computer System

LTHOUGH it is not a new entry to the world of personal computers, the Apple II Plus is by far one of the most flexible and powerful machines available. Based on the 6502 microprocessor and an 8-bit bidirectional bus with eight so-called peripheral slots, the system can accommodate a wide range of applications. Essentially, the Apple II Plus is an upgraded version of the Apple II, containing built-in Applesoft and with the Integer BASIC dropped.

As designed, the Apple II Plus can operate with either a conventional TV receiver or a video monitor. When used with the former, the system needs an r-f modulator that meets FCC requirements. Performance is good either way, but the monitor is the best choice when color of very high quality is required.

The computer's enclosure is compact enough to be easily portable, and has a pleasing color. Other accessories, such as the video monitor, disks and printers, are outboard to the main unit. A carrying case, with pockets for cables, is provided for the main-frame section.

A basic Apple II Plus system with 16K bytes of RAM, ROM- resident Ap-

plesoft Extended BASIC, Auto-Start ROM, disassembler, and reference manuals—of which there are many—is priced at \$1330. However, locating a 16K system may be difficult, as Apple has elected to provide only 48K systems (which cost \$1530) to distributors. This has caused retailers some consternation, but, in our opinion, an extra 32K bytes of RAM for \$200 represents a good buy.

The configuration that we used for our evaluation consisted of:

Apple II Plus with 48K RAM and all	stan-
dard features\$	1,530
Disks II, a 16-sector 5.25-inch si	ingle-
density floppy with interface and	
DOS 3.3	645
Second disk drive	525
12-inch monochrome Sanyo monitor	320
Silentype printer with Apple II	
interface	635
Language System with Apple Pascal	495
SSM Microcomputer Products AIO	
serial and parallel Apple	
interface	195
Microsoft RAMcard	195
Z-80 Softcard	349
September 1997 and 1998 and 1998	1,919

In addition to the above, Personal Software has made available: VisiCalc, Visidex, Visitrend/Visiplot, and Visiterm. Agent Computer Services provided the Buffered Modem program for testing the viability of communications, and Vista provided the Model-150 40-character keyboard buffer.

Plus consists of a molded, high-impact plastic case that houses the 6502 CPU, a high-efficiency switching power supply with sufficient shielding to avoid EMI and RFI difficulties, a 52-key typewriter-style full-stroke keyboard, cassette recorder input and ouput jacks, and video display output jack. The system backplane contains eight peripheral slots.

The system keyboard sports 2-key rollover and four special-function keys: CTRL (control), ESC (escape), RESET (used to restart the system), and REPT (repeat—provides automatic repetition of a depressed key). The coding is upper-case ASCII. Lower case is omitted, but can be added by plugging in a PROM with a new character set.

(Continued on page 40)

(Continued from page 39)

The standard display is memory mapped into system RAM and provides three display modes: text, low-resolution graphics, and high-resolution graphics. In the text mode, the display is 960 characters (25 lines × 40 columns), with each character generated in a 5×7 dot matrix. Upper-case characters, 64 in all, are generated in either a normal, inverse, or flashing mode.

The hallmark of the system is its sophisticated graphics. In the low-resolution mode, 1920 blocks are available (40 × 48 array) in a total of 16 colors. In the high-resolution mode, 53,760 dot locations (280 × 192 array) are available, and up to six colors (black, white, red, blue, green, and violet) can be displayed.

Because it is memory mapped, exact locations on screen can be pin-pointed by software to create some exciting and spectacular displays. To enhance this capability, the screen memory is divided into two areas, or pages. This primary/ secondary page configuration lets you flip pages in and out to create animation. Moreover, by employing the soft switches of the operating monitor, you can invoke a variety of graphics modes and mixed modes (graphics and text). In addition, the system includes a loudspeaker and joystick controllers.

Numerous well-written manuals are supplied with the system. For example, to get you going, there is the 200-page Apple II Reference Manual. This manual provides information on the basic working of the system (including schematics) and supplies such data as important screen addresses and a listing of the ROM monitor. Other manuals explain-in similar detail-Applesoft BA-SIC, and PASCAL, as well as the use of the DOS.

Our sample system used the language card that bundled PASCAL. Recently, Apple has unbundled the PASCAL portion, offering the upgrade in memory separately. This is probably for compatibility with the Microsoft RAMcard, which was designed to work with existing Apple software and PASCAL.

The Plus II comes equipped with integer ROM-based BASIC and diskextended Applesoft BASIC. The integer version doesn't support floating-point arithmetic and is like an expanded tiny BASIC. The extended version, however, offers complete BASIC capabilities, including a full set of graphics primitives, and peripheral controller calls such as PDL for paddle. (This function returns the current value from 0 to 255 of the game control specified as the argument. Unfortunately, we didn't have game controls, but are reasonably sure that everything works as advertised.)

The disk subsystem we used, a controller, and two drives, derives power right from the bus, thus reducing the number of wires hanging from the back of the enclosure. The only cable connections run from the controller card to the

In a system of this size, two drives—

all that are generally used-seem to be more than sufficient. However, you can add additional controllers and have as many as six drives. One interesting approach is to add an 8-inch controller and use both the 5.25-inch and 8-inch drives in tandem. Adding the larger drives means that power for them must be taken from external power plugs.

Like the disk system, the Silentype thermal printer works in conjunction with a bus-oriented controller card. This fits into slot-1, and provides operating power as well as all the necessary control signals. The Silentype handles both alphanumerics and graphics. The graphics are presented in a raster format that permits the printing of complete dot-bydot pictures.

Unfortunately, to get multiple copies from the printer, you must do a multiple printing. This can be overcome by using an SSM AIO serial/parallel card and adding either a dot-matrix or daisywheel impact printer. This assumes, of course, that you have an open slot for the interface.

Even though the Apple is designed around the 6502 and is meant to use software developed for that CPU, the addition of a Z-80 microprocessor-via a Microsoft Softcard—greatly extends its capabilities. This, moreover, is done without degrading the functioning of the 6502. The Softcard provides all the features one would expect from a Z-80, including support of the CP/M operating system. However, operation is more complex than it may seem. The Z-80 provides computing power, while the 6502 handles all I/O including operation of the screen display under Z-80 supervision. This arrangement is both speedy and efficient.

Evaluation. The Apple II, almost regardless of configuration, is easy to use. Because of the very carefully written, concise manuals, setting up a system like the one we used is straightforward, and takes only about 30 minutes.

Although not CP/M compatible, the disk operating system (DOS3.3) handles simple jobs extremely well. For example, initializing a disk is done by formatting it via a utility, then writing a Hello program under BASIC. This we found intriguing, as it meant we could be very inventive in our sign-on messages. Furthermore, for turnkey-type operation, our sign-on could be a unique program that interfaces to a larger program or other programs—a menu system, if you

When the system is first turned on, the unit begins looking for a disk to load. This is a function of the Auto-Start ROM and can be quite disconcerting at first, especially if you were planning to go into ROMBASIC. To suppress disk operation, simply hold down the RESET key while powering up. Should you power up and want to stop the disk, depressing RESET, will drop you into the ROMresident language and stop the drives. If RESET is not used, the drives will run

without timing out, which could be a minor problem.

Rumors have circulated concerning the Apple's susceptibility to heat, especially after it has run for long intervals of time. But try as we might, running it for extended periods and deliberately restricting its ventilation, we could induce no heat-related malfunctions, even with the air around the main circuit board at 110°F. We conclude, therefore, that whatever problems the system had in this area have been solved.

Evaluating the system further, we took a program that would link to other files, read and hold tax tables, and update other files. The purpose was to determine whether or not the data would always be accurate as it transferred between files and out to a printer. We set an arbitrary limit of 500 items.

The whole process took about 1 hour and 30 minutes to generate, and another hour and 15 minutes to perform the swaps and sorts. In our test, no data was

Going further, we tried a program that would generate graphics on the screen, using the database already generated. That data was handled with accuracy, but not with dispatch. (However, it must be remembered this is a floppy-based system and speed is not one of its prime virtues.)

Our next test used Personal Software's Visidex, which is designed to take information in any format and return it either on the screen or printer, sorted or unsorted. This program relies on the channel speed of the disk system to display information quickly. Access to a disk record is almost instantaneous. Furthermore, the software package is timeoriented so that records can be related either to system time (date and clock time) or actual time, assuming that you have a real-time clock.

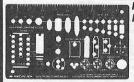
Next, we tested to see if quickly raising and lowering line voltages would damage the rather large database we maintain under Visidex. It did not. Operation was unaffected by line voltages from 75% to 130% of nominal.

One annoying shortcoming was the lack of upper/lower case character set. Even though correctable through purchase of an ROM for about \$65 this omission seems out of place in an otherwise sophisticated system. Furthermore, the location of the arrowed keys is a problem since it is easy to hit one when your goal is the RETURN key. Even worse is the location of the RESET key directly above RETURN. We would have also liked to see some special-function keys, either fixed or user-definable.

Although the backplane design offers flexibility by memory-mapping devices into the system, it does assume that the operator has intimate knowledge of the machine. What would have been nice is a utility program under DOS that would check each slot for a device and determine if it could be properly interfaced. Should the installed card not be of Apple origin or directly supported by Ap-

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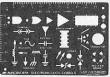
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ple, its attributes could then be requested and held in a system map file. Application programs could use this file by simply calling the device.

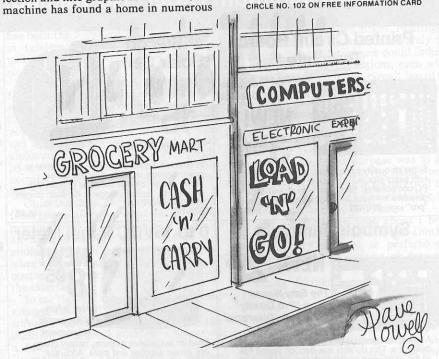
As described, we encountered no problems with heat or, for that matter, bus loading. But we noticed that it does become a tight fit when you start adding cards to the backplane; such is the price of ready portability. And speaking of portability, a card-restraint cage would be a nice touch, even at a slight cost.

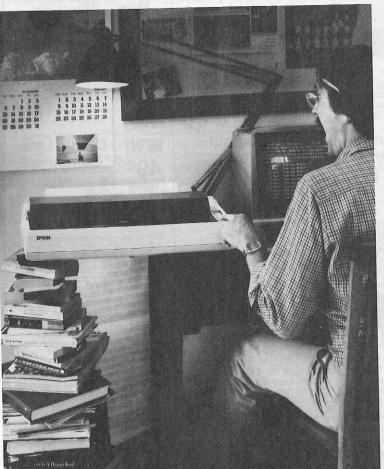
Comments. The Apple is one of the most widely supported machines on the personal computer market today, with over 300 companies providing hardware, software or both. Additionally, numerous manufacturers see the machine as a low-cost entry to the high-end graphics marketplace.

Interestingly, though this may be strictly our perception, the audio aspect of the machine has not caught on. But this may be changing. According to some observers, sophisticated voice-output devices will make the machine downright conversational.

As far as we are concerned, the Apple II Plus gets high marks and has no serious shortcomings anywhere. But as capable as this machine is, we aren't convinced that it is ideal for business. We do believe, however, that it fits well into environments requiring rapid data collection and into graphic arts. In fact, the

schools that use it for teaching everything from computer science to manu--Carl Warren facturing skills. CIRCLE NO. 102 ON FREE INFORMATION CARD





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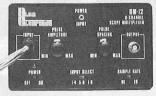
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